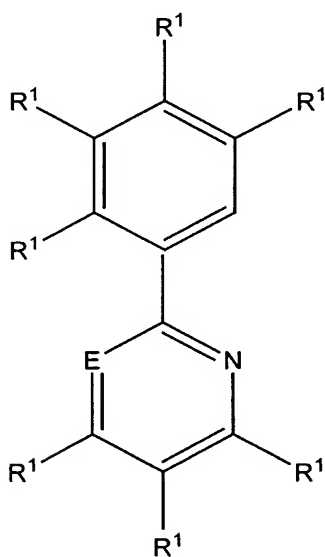


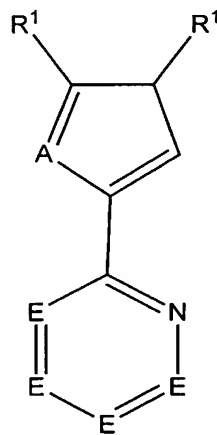
CLAIMS

What is claimed is:

1. A luminescent organometallic complex composition of matter, the composition comprising
  - 5 at least one transition metal, M, that produces phosphorescent emission at room temperature;
  - at least one first monoanionic bidentate ligand coordinated through a nitrogen on a heteroaromatic ring and a carbon which is part of an aromatic group; and
  - 10 at least one second ligand selected from a hydride and a ligand coordinated through a carbon atom on an aromatic group.
2. The composition of Claim 1, wherein M is selected from a metal listed in Groups 3-12 of the Periodic Table.
3. The composition of Claim 1, wherein M is selected from a
  - 15 metal listed in Groups 8-11 of the Periodic Table.
4. The composition of Claim 1, wherein M is selected from a group consisting of Ir, Rh, Ru, and Os.
5. The composition of Claim 1, wherein the first ligand is selected from an arylheterocycle and a heteroarylheterocycle.
- 20 6. The composition of Claim 1, wherein the first ligand is selected from ligands having Formula I and ligands having FormulaII:



Formula I



Formula II

wherein:

- $R^1$  is the same or different at each occurrence and is selected from H, D,  $C_nH_{2n+1}$ ,  $C_nH_{n-1}$ ,  $OR^2$ ,  $SR^2$ ,  $N(R^2)_2$ , F,  $C_n(H+F)_{2n+1}$ ,  $OC_n(H+F)_{2n+1}$ ,  $OC_nH_{n-1}$ , and  $OCF_2X$ , or adjacent pairs of  $R^1$  can be joined to form a five- or six-membered ring;
- 5  $R^2$  is the same or different at each occurrence and is H,  $C_nH_{2n+1}$ , or  $C_n(H+F)_{2n+1}$   
A is S or  $NR^2$ ;  
E is the same or different at each occurrence and is N or  $CR^1$ ,  
X is H, Cl, or Br, and  
10 n is an integer from 1 through 20.
7. The composition of Claim 6, wherein the first ligand is selected from phenylpyridines, phenylpyrimidines, and phenylquinolines.
8. The composition of Claim 1, wherein the second ligand is a ligand having Formula III
- 15  $Ar[-(CH_2)_m-Y]_p$  Formula III  
wherein  
Ar is an aromatic group,  
Y is a group having a heteroatom capable of coordinating to metal M,  
20 m is 0 or an integer from 1 through 20,  
p is an integer from 1 through 5,  
and further wherein one or more of the carbons in  $(CH_2)_m$  can be replaced with a heteroatom and one or more of the hydrogens in  $(CH_2)_m$  can be replaced with D or F.
- 25 9. The composition of Claim 8, wherein Y is selected from  $NR^2$ ,  $OR^2$ ,  $SR^2$ , and  $PR^3$ , wherein  
 $R^2$  is the same or different at each occurrence and is H or  $C_nH_{2n+1}$ ;  
and  
 $R^3$  is the same or different at each occurrence and is selected from  
30 H,  $R^2$ , and Ar.
10. The composition of Claim 1, wherein the organometallic complex further comprises at least one additional ligand selected from a group consisting of amines, phosphines, alkoxides, halides, hydrides and orthometalated aryl groups.
- 35 11. The composition of Claim 1 having a luminescence emission maximum in the range of about 440 nm to 540 nm.

12. The composition of Claim 1, wherein M is iridium, the first ligand is a phenylpyridine with substituents, the second ligand is a hydride, and further comprising two triarylphosphine ligands.

5 13. The composition of Claim 1, wherein M is iridium, the first ligand is a phenylpyridine with substituents, the second ligand is bidentate and coordinated through a phenyl ring, and further comprising a PBz<sub>3</sub> ligand.

10 14. The composition of Claim 1, wherein M is iridium, the first ligand is a phenylpyridine with substituents, the second ligand is a hydride, and further comprising two PPh<sub>2</sub>Bz ligands.

15 15. The composition of Claim 1, wherein M is iridium, the first ligand is phenylpyridine with substituents, the second ligand is a phenyl ring, and further comprising two PPh<sub>2</sub>.

16. The composition of Claim 1, wherein M is iridium, the first ligand is phenylpyridine with substituents, and L<sup>2</sup> is a hydride.

17. An electronic device including a light-emitting layer comprising at least one organometallic complex comprising:

a transition metal M that produces phosphorescent emission at room temperature;

20 a first monoanionic bidentate ligand coordinated through a nitrogen on a heteroaromatic ring and a carbon; and

a second ligand selected from a hydride and a ligand coordinated through a carbon atom which is part of an aromatic group.

25 18. The device of Claim 17, wherein the organometallic complex further comprises at least one ligand selected from a group consisting of amines, phosphines, alkoxides, halides, hydrides and orthometalated aryl groups.

30 19. The device of Claim 17, wherein M is selected from a group consisting of a transition metal selected from Groups 3-12 of the Periodic Table.

20. The device of Claim 17, wherein M is selected from a metal listed in Groups 8-11 of the Periodic Table.

21. The device of Claim 17, wherein M is selected from a group consisting of Ir, Rh, Ru, and Os.

35 22. An electronic device comprising:

a photoactive layer for emitting light;

an electrode layer; and

a layer of charge transport material located between the photoactive layer and the electrode layer, wherein at least one of the

photoactive layer, the electrode layer, and the layer of charge transport material includes an organometallic complex comprising:

a transition metal M that produces phosphorescent emission at room temperature;

5 at least one first monoanionic bidentate ligand coordinated through a nitrogen on a heteroaromatic ring and a carbon; and

at least one second ligand selected from a hydride and a ligand coordinated through a carbon atom which is part of an aromatic group.

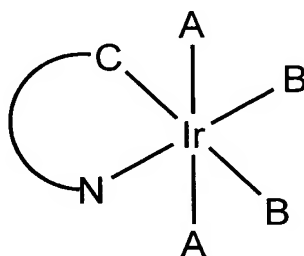
23. The device of Claim 22, wherein the organometallic complex  
10 further comprises at least one ligand selected from a group consisting of amines, phosphines, alkoxides, halides, hydrides and orthometalated aryl groups.

24. The device of Claim 22, wherein M is selected from a metal listed in Groups 3-12 of the Periodic Table.

15 25. The device of Claim 22, wherein M is selected from a metal listed in Groups 8-11 of the Periodic Table.

26. The device of Claim 22, wherein M is selected from a group consisting of Ir, Ru, Rh, and Os.

27. A phosphorescent organometallic composition capable of  
20 emitting blue light, the composition having a Formula IV:



Formula IV

25 wherein

C-N represents a monoanionic bidentate ligand coordinated through a nitrogen on a heteroaromatic ring and a carbon;

A represents a monoanionic ligand attachment,

B represents a nonionic ligand attachment,

30 wherein one or more of A's and B's may be joined together with each other, and at least one of A is a hydride or a carbon which is part of an aromatic group.

28. A method of generating blue light, the method comprising:

providing an organometallic complex comprising:  
a transition metal M,  
5 at least one first monoanionic bidentate ligand coordinated  
through a nitrogen on a heteroaromatic ring and a  
carbon,  
at least one ligand selected from a hydride and a ligand  
coordinated through a carbon atom which is part of an  
aromatic group; and  
10 stimulating the organometallic complex to trigger phosphorescent  
emission.